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ABSTRACT

This study examines research that is part of an alternative paradigm in information needs and uses assessment. Approaches in the alternative paradigm include Sense-Making, Value-Added, and Anomalous States of Knowledge. From an analysis of these approaches and related research, a conceptual model has been developed. The model focuses on several elements that should guide the design and implementation of information systems: (1) the information system should be user-oriented (oriented toward the individual or group with the information need); (2) information needs should be determined as they relate to users in particular situations or contexts; and (3) in information systems mediated by intermediaries, the success of the user-intermediary interaction is of prime importance in determining information need. The model also focuses toward the development of a theory of relevance that considers qualitative and contextual judgements. (Contains 51 references.) (Author/JLB)

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THE IMPORTANCE OF USER-ORIENTED APPROACHES IN THE DESIGN AND IMPLEMENTATION OF INFORMATION RETRIEVAL SYSTEMS

A Master's Research Paper submitted to the
Kent State University School of Library Science
in partial fulfillment of the requirements
for the degree Master of Library Science

by

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ABSTRACT

Historically, information systems have been technology- and content-driven. User information needs have been addressed based on what the system possesses, instead of from the perspective of what users think they need. Much of information needs and uses research has failed to inform information systems practice. There are research efforts, however, that approach the problem from more of a user orientation. This study examines research that is part of an alternative paradigm in information needs and uses assessment. Approaches in the alternative paradigm include: Sense-Making, Value-Added, and Anomalous States of Knowledge. From an analysis of these approaches and related research, a conceptual model has been developed. The model focuses on several elements that should guide the design and implementation of information systems: 1) the information system should be user-oriented (oriented toward the individual or group with the information need); 2) information needs should be determined as they relate to users in particular situations or contexts; and 3) in information systems mediated by intermediaries, the success of the user-intermediary interaction is of prime importance in determining information need. The model also focuses toward the development of a theory of relevance that considers qualitative and contextual judgments.

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CHAPTER I

INTRODUCTION

Statement of Problem

One need only to sit in a library to observe, that there are improvements that need to be made in the design of information systems. Minutes or hours may pass before any library user reaches for one of the Library of Congress Subject Headings books to aid in an online public access terminal (OPAC) search. In the same library, a user sitting at an OPAC terminal may turn around in frustration, looking for a friendly (or any) face to help figure out the operation of the terminal. Meanwhile, the instructions for simple author, title, and subject searches are written on one screen directly in front of that user.

Those examples are not isolated events--neither are they intended to downplay the contributions of LC documentation and OPACs. But they do point out shortcomings of information systems, many of which fail, because they do not properly analyze the information use environment.

The idea for a study comes from a literature review in the 1986 edition of the Annual Review of Information Science and Technology (ARIST). The review focuses on conceptual developments in defining and measuring information needs. It cites a failure of

much of information needs and uses research to inform information systems practice, because of too great a focus on what the system possesses, instead of from more of a perspective of what users think they need (Dervin and Nilan 1986, 17). The review highlights three alternative approaches to needs assessment: the User-Values Approach, the Sense-Making Approach, and the Anomalous States of Knowledge (ASK) Approach. Their common ground includes an assumption that the user perspective is important.

This study will examine the user perspective in the design of information systems. It will analyze the concepts and methodologies of various user-oriented approaches to information needs assessment research, including Taylor's Value-Added Approach (i.e., User-Values Approach), Dervin's Sense-Making Approach, and Belkin's ASK approach. A conceptual model will be presented, focusing on several elements that should guide the design of information systems: 1) the information system should be user-oriented (oriented toward the individual or group with the information need); 2) the information needs should be determined as they relate to users in particular situations or contexts; and 3) in information systems mediated by human intermediaries, the success of the user-intermediary interaction is of prime importance (Note: the human intermediary is the information systems specialist who supplements the system). This model is noteworthy for its focus toward the development of a theory of relevance that considers qualitative and contextual judgments.

Limitations of the Study

The constraints of this study include the availability and accessibility of information sources.

CHAPTER 2

LITERATURE REVIEW

Research has indicated that the practice and evaluation of information systems should orient itself (or be reoriented) toward users. But research has been slow in providing guidance for the reorientation (Dervin and Nilan 1986, 8). Joan Durrance says there has been a research bias toward an emphasis on sources, and neglect about the behavior of those who need information (Durrance 1988, 173). Historically, information systems have been technology-driven (e.g., book, computer) and content-driven (e.g., classification of knowledge) (Taylor 1986, 23). The constraints of books and computers, among others, have been the determinants of technology-driven models. In content-driven models, package content (e.g., subject, storage organization, retrieval) has established boundaries and objectives (Taylor 1986, 24). There has been support for developing additional criteria that reflect as much of the user situation as possible. Some researchers say the focus ought to be on problems, not just questions, i.e., there should be a greater focus on context than there is presently in many information systems (see Wersig and Windel 1985; Derr 1983).

The 1986 ARIST review suggests that the technology- and content-driven models are part of a 'traditional' paradigm in information needs and uses research. The Value-Added, Sense-Making,

and ASK approaches represent 'alternative' paradigms, i.e., there is more of a receiver-oriented focus. An alternative paradigm would include the study of complex, multidimensional human behavior, and a focus on situations to aid in needs assessment (Dervin and Nilan 1986, 13). The traditional paradigm addresses user questions in a trans-situational manner. It does not focus on the idea that the cognitive maps of users are constantly changing. Traditionally, information needs and uses research has looked at users in context with user/system intersection. The alternative paradigm calls for a shift in focus to wholistic experience. It should be noted that, in the course of the discussion of these paradigms, there is much gray area to be considered, i.e., there is overlap in the paradigms--they should be thought of as on the same continuum.

In the Sense-Making Approach, developed by Brenda Dervin and her colleagues, sense-making is the label for a set of concepts and methods for studying how people make sense of their worlds. In the process of sense-making, an individual user is unable to make sense of a certain situation; thus, the user has reached a gap (i.e., has a question about how to proceed) and must make use of a "bridge" to move across that gap (Dervin 1983a, 2). The focus is on why and how people build certain bridges. In assessing the nature of the gaps over which these bridges might be built, Dervin borrows from the 5-W approach used in journalism: 1) identity and characteristics of people (who); 2) event (what); 3) location of entities in time (when); 4) location of entities in space (where); reasons behind

events (why); and the manner in which things can be implemented (Dervin 1981, 79).

Because of its communication orientation, Sense-Making research methodology relies heavily on interviewing for data collection and analysis. Its core technique is the Micro-Moment Time-Line Interview (a micro-moment is a specific situational moment in time-space) (Dervin 1983a, 9). The technique requires respondents to explain in a step-by-step manner how they have tried to make sense of some situation, indicating what happened first, second, etc. The in-depth interviewing process can be labor-intensive and time-consuming. For example, interviews ranged from 30-420 minutes in a a study of eighty-two cancer patients being treated at the University of Wisconsin hospitals (Dervin 1983a, 28).

Dervin's research has studied the information needs of everyday citizens. Among her findings, the general public typically displays low use of books, newspapers, and magazines; people tend to use formal information sources in a small sub-set of situations. Most citizens tend to rely on close friends or relatives for their information (Dervin 1983b, 7).

In an empirically-based research effort, Dervin and colleagues attempted to assess and describe the everyday information needs of citizens of California (Dervin 1984, 1). Using the Sense-Making approach, some 1,040 Californians aged 12 and older were sampled in a study using an interview methodology (Dervin 1984, 5). Findings that supported Sense-Making included: help traditionally expected

from information was an understanding of situations (Dervin 1984, 39), and citizens would be likely to turn to friends/neighbors, religious leaders, and other sources when they wanted to identify sources or services for help (Dervin 1984, 40).

The study's results have implications and applications for the design or redesign of programs in library settings. Programs might be designed that would seem more likely to offer the kinds of help that a certain subgroup will seek within a certain situation. For example, young people were more likely to indicate that they used the library to make contact with others (Dervin and Fraser 1985, 31-32). For libraries, being able to translate their services into human terms may have public relations value. It is one thing to say that a library circulated 2 million books or had 300,000 users in a given year; it is another to say that 34% of those users felt "connected to others" or "not alone" due to visiting the library, or that 93% "got support" because of a visit to the library (Dervin and Fraser 1985, 31).

Also related to the use of Sense-Making in library settings, Dervin and her colleagues have developed a neutral questioning approach to the reference interview. The approach calls for the use of neutral questions--a subset of open questions--with a goal of guiding the conversation along dimensions that are relevant to all information-seeking situations, i.e., the nature of the underlying situation, the gaps faced, and the expected uses (Dervin and Dewdney 1986, 508-9). Neutral questioning is a technique for understanding the user's need from the user's vantage point. It

involves a structured interview, but it also allows the user to "let his story unfold." Some librarians have said that the systematic process is helpful, and that they have found good matches of sources to actual user needs. Other librarians have said that the technique seems like "prying" (Dervin and Dewdney 1986, 511-12).

One of Dervin's colleagues, Michael Nilan, has used variations of the Sense-Making Approach as a basis for research into information needs and uses. In discussing the need to employ user-oriented criteria for maximum information system effectiveness, Nilan mentions three past hindrances to research that has tried to use the "user's" perspective on information needs: 1) historically, there has been a feeling in information science that, when information systems have been ineffective, it was because users were not trained properly (users should adjust to the system, instead of the other way around); 2) the idea of making systems more like users has, in the past, seemed like a sensible idea to certain researchers; however, translating the complexities of human behavior into system specifications has not been an easy task; and 3) there has been too much emphasis in information science on organizing and retrieving information on the basis of "topic" alone, e.g., subject, author, title, and field (Nilan and Fletcher 1987, 186), i.e., content-driven systems.

In his empirical research efforts, Nilan and a colleague have used a Sense-Making-related methodology for a study related to a National Science Foundation (NSF) project. The project centered on

changing a manual request-for-proposals (RFP) process to an electronic mail system-based process (Nilan and Fletcher 1987, 186). The researchers attempted to create a user-defined, situational model of the RFP process. The steps undertaken in the process, e.g., starting/reviewing possibilities and formulating topic/area, were synthesized. Interviews were used to determine questions that study participants had at specific time-space points, as well as the uses to which the answers to their questions would be put (Nilan and Fletcher 1987, 190). The intent of the study was to develop patterns of user perceptions, which would translate into successful information system design.

Another empirical research study by Nilan and a colleague centered on source-evaluation behavior in information seeking and use. The study addressed what the researchers called a shift in information science research focus from system performance toward the analysis of human cognitive behavior. And with the resulting shift, each of the components of relevance, e.g., source-evaluation, then have to be examined (Halpern and Nilan 1988, 169). The researchers used Sense-Making concepts to gain insight into: 1) source-evaluation criteria that people apply to information seeking and use; 2) cognitive behavior used in developing and applying criteria used in source evaluation; and 3) specific points in the information seeking process where those criteria are applied (Halpern and Nilan 1988, 171). Among the study's findings, there was a wide range of source-evaluation criteria used by respondents (Halpern and Nilan 1988, 173), e.g., authority or expertise based

on credentials, authority or expertise based on experience, and only perceived source (Halpern and Nilan 1988, 176).

In another study by Nilan and colleagues, research was undertaken to develop procedures and empirical generalizations that would allow software developers to develop application software for desktop publishing that employed user criteria (Nilan and others 1989, 104). The basis for the study was the assumption that a gap currently exists between the ways in which users express their needs and the way in which a typical system interface functions (Nilan and others 1989, 104). Using an adaptation of Sense-Making, respondents underwent 1-2 hour interviews in which they were asked to describe the desktop publishing process (from start to finish) in which each was involved (Nilan and others 1989, 105). The activities in the process described by the respondents were used as primitive data for developing standards for user interfaces (Nilan and others 1989, 109).

In Robert Taylor's Value-Added Approach, there is a user-oriented focus; it is meant to complement technology- and content-driven models. It is practice-driven; it starts from operating systems rather than intellectual structures. The Value-Added Approach is a means of describing formal social practices called information systems. There are three components in the approach: 1) a formal system that includes specific processes, which add value to what is being processed; 2) a user or set of users who, because they sit in particular environments, have problems, which establish the criteria for judging the output of the system; and 3) a

negotiating space between the system and users: in that space, the system displays outputs and the values accumulated through the system to assist users in making choices. (Taylor 1986, 201).

In being able to determine patterns that are intrinsic to particular groups, Taylor has looked at problem dimensions, i.e., characteristics that, beyond specific subject matter, set up the criteria for determining the relevance of information to specific problems or to a class of problems in different contexts (MacMullin and Taylor 1984, 109). In addition, these problem dimensions can be directly related to information traits--special attributes used to define the ways in which information can be identified and presented (MacMullin and Taylor 1984, 98).

The study of patterns in the use of information is a response to, what one researcher calls, a chronic problem with information systems that are designed to handle facts alone: they try to change input values into a quantitative dimension; there is no provision for sending the user's opinion along with product (Hall 1981, 103). Groups of people may share priorities in value and a set of meanings for words. At the same time, other groups with equally valid viewpoints may use a different set of values and semantic shifts (Hall 1981, 103). Studying patterns is useful for examining the different viewpoints that users bring to different situations.

Another researcher, Krikelas, who calls for the study of patterns of information use, says that because people have information needs within a wide range of personal and job-related situations, the isolation of separate environmental elements would

be futile. Potentially useful hypotheses might be gained, though, through an awareness of the variety of environments (Krikelas 1983, 11).

In Taylor's Value-Added Approach, the third component, negotiating space, is the "no-man's land" between the system and a human being, who could benefit from the system's outputs. Often, the system ends where the technology ends (Taylor 1986, 33). This negotiating space, or interface between the system and user, has been the subject of research by Taylor, which preceded his introduction of the Value-Added Approach. He has studied the question-negotiation process as it relates to information seekers in libraries (this can also apply to library-related settings). Question-negotiation begins with a user, who has an inquiry, i.e., a description of an area of doubt regarding some information need (Taylor 1968, 179). A human intermediary must examine the user's levels of needs in order to better understand the request. That is, the intermediary should try to examine the components of that need as it progresses toward presentation in the form of an inquiry that uses system terms (Taylor 1968, 182). This filtering process includes an examination of user objectives and motivations (Taylor 1968, 183).

In other earlier research by Taylor about the questioning process, he has provided a detailed examination regarding the four levels of question formation: 1) the actual, but unexpressed need for information (visceral); 2) the within-brain description of the need (conscious); 3) the formal statement of the need (formalized);

and 4) the question as presented to the information system (compromised) (Taylor 1962, 392).

In related research, question generation and formulation have been studied to see if they can be used as indicators of information needs (Horne 1983). Another study has used Taylor's four levels of question formulation as a base for analyzing the relationship of those four levels to the online presearch interview process (Markey 1981, 215).

A third alternative approach, as presented in the 1986 ARIST literature review by Dervin and Nilan, is the Anomalous States of Knowledge (ASK) approach, developed by Nicholas Belkin and his colleagues. The hypothesis of ASK is that an information need arises from a recognized anomaly in a user's state of knowledge regarding some topic or situation. In general, the user is unable to specify precisely what is needed to resolve that anomaly (Belkin, Oddy, and Brooks 1982a, 62). In a typical information retrieval system, the "best match" principle is used. According to Belkin and colleagues, that principle includes a representation of a user's request for information and a system response of a text whose representation most closely matches the request (Belkin, Oddy, and Brooks 1982a, 63). The texts are equivalent to the knowledge resource, which Belkin says interacts dynamically with the other two components of an information system: the user and the intermediary mechanism (Belkin 1984, 112). In ASK, there is an attempt to represent the anomalies in a topic as a network of concepts and relations (Daniels 1986, 274). The strength of the

associations between concepts is indicated by their distance from one another. A statistical analysis of texts is used to elicit the networks (Daniels 1986, 274).

A small-scale design study of the ASK approach has shown that adequate representations of ASKs can be derived through problem statements, and that abstracts can serve as sufficient document surrogates in the information retrieval system. The research has also shown that problems related to several areas exist: 1) retrieval mechanisms; 2) refining of analytic procedures; 3) classification of ASKs; and 4) the interactive environment (Belkin, Oddy, and Brooks 1982b, 160-61).

An article by Belkin about the cognitive viewpoint in information science provided a springboard to research related to the ASK approach (Belkin 1990, 11-12) and, generally, to the alternative paradigm in information needs and uses research. In the article, Belkin said that the essence of the cognitive point of view is that it explicity considers that the states of knowledge and beliefs, etc., of human beings (or information processing devices) mediate (i.e., interact with) with that which they receive/perceive or produce (Belkin 1990, 11-12).

Concepts in the ASK approach were used by one researcher to develop a software program, THOMAS, as a means to browse online (Oddy 1977, 6). The researcher assumes that a user does not necessarily know what he wants (from an information system), but will know it when he finds it (similar to browsing). Another assumption is that the user and intermediary (in this case, a

machine intermediary) each have a world model (e.g., THOMAS' includes knowledge about how literature is organized), and that each must construct a model of the other's interest in relation to his/its own view of the world. With THOMAS, the user reacts to what the system displays, instead of employing the usual query formulation (Daniels 1986, 295).

In another study based on ASK concepts, researchers compared answers from a continuous word association test with the original vocabulary used in the user information needs descriptions. A user's problem statement represented a conceptual state of knowledge (possibly one filled with anomalies) regarding the problem (Palmquist and Balakrishnan 1988, 160). The study hypothesized that the user's vocabulary is more diverse than what appears in an initial problem statement (Palmquist and Balakrishnan 1988, 161).

The cognitive viewpoint has provided the framework for a study of search procedures in public libraries (Ingwerson 1982, 165). The researchers, from the Royal School of Librarianship in Copenhagen, Denmark, used a cognitive approach as the basis for a model of the library communication process, which presented images of the user, the human intermediary, and the generator (Ingwerson 1982, 165) (i.e., the parallel to the knowledge resource component of the Belkin information system). The purpose of the study was to gain detailed information about three information transfer processes in reference work in libraries: 1) the user's interaction with the document organization; 2) the user/librarian negotiation process;

and 3) search patterns and thought processes in the librarian's search procedure (Ingwerson 1982, 165).

Thomas D. Wilson is another researcher who, according to Belkin, supports the cognitive point of view (i.e., the alternative paradigm), focusing explicitly on human information behavior, and on the centrality of the concepts of "understanding" and "meaning" to that viewpoint (Belkin 1990, 13). For Wilson, that "meaning" is part of all aspects of information transfer and use, and also in the way people define themselves, their lives, and their actions (Wilson 1984, 197).

In a study that explored the everyday world of work, Wilson said that an aim of the cognitive approach to information seeking behavior and use is to discover how people's images and frames of reference in the work environment relate to the availability of information, and how the choice of information is determined by the image, or otherwise affects a frame of reference (Wilson 1984, 200).

The wholistic view of the information user that is supported by Wilson is evident in another conceptual research study, in which he examines the motivations for information-seeking behavior. He suggests that the full range of human personal needs is at the root of motivation toward information-seeking behavior (Wilson 1981, 9). Information is only one means toward the ends of satisfying the fundamental needs of users (Wilson 1981, 10).

Wilson's empirically-based research efforts include Project INISS, the investigation of the information needs of social

services staff in the UK (Wilson and Streatfield 1977). The project was, according to Wilson, an alternative to much of previous information needs research, which had been descriptive. (Wilson and Streatfield 1977, 279). Because it had been descriptive, the research had not generated ideas for the practical improvement of information services. Project INISS focused on observing how workers interact within the total communication system of an organization (Wilson and Streatfield 1977, 279). Among the findings of the study, it was noted that the complexity of the organizational structure studied argued for the development of information services which mirror that complexity (Wilson and Streatfield 1979, 132).

Wilson's claim that past descriptive research has not provided data that is translatable into practical solutions has been echoed by other researchers. In one study, a management-oriented model was proposed for describing and studying information behavior. It was hypothesized that environmental and situational variables would be able to provide data for systems designers and management policy-makers (Mick, Lindsey, and Callahan 1980). The study used an interview methodology to examine the information seeking behavior of scientists and engineers in a variety of settings and roles (Mick, Lindsey, and Callahan 1980, 347). Among the study's findings, given the complexity of information flow within an organization, management interventions to change behavior must be tailored to specific situations (Mick, Lindsey, and Callahan, 354).

CHAPTER 3

METHODOLOGY

The research undertaken in this study is of a conceptual nature. It is characterized by defining terms, analyzing concepts and methodologies related to information needs and uses, and pooling the existing research into a more cohesive conceptual model, which will provide guidelines for the design of information systems. A conceptual model should include (but not be limited to) the following: 1) information systems should be more user-oriented; 2) there must be an identification of users'information needs as they relate to particular environments or situations; that is, systems are oriented to classes of users generally; 3) in information systems mediated by intermediaries, the interaction between the user and a human intermediary is of prime importance in developing criteria that can be used in information systems design. The components of this model will be discussed as to their potential role in the development of theory that leads to a view of relevance that considers contextual and qualitative judgments.

One component of this model proposes that information systems should be more user-oriented, i.e., there must be an identification of the specific needs of users. The term needs refers to physiological, affective, and cognitive needs--not just cognitive needs--as has been proposed by some user-oriented researchers.

Dervin's focus on affective needs is an important one (as is Wilson's), no matter how difficult it is to translate them into criteria for systems design. One only need to turn to a daily newspaper's editorial page and examine the emotion-laden letters to the editor to witness the importance of that aspect of human needs--an aspect that must at least be acknowledged by information systems designers amid the limitations of information retrieval systems. The needs discussed here may sometimes lead to information seeking to satisfy those needs, as Wilson and others have said. His perspective is that of a wholistic user environment. In such an environment, the motivations of users need to be examined. For Taylor, the examination of motivations is part of the filtering process. In a user-oriented information system, motivations, as well as cognitive needs, should be at the base of what inputs are considered among factors related to design criteria. It is important to understand "why" people need information, not just "what" information is needed. In a user-oriented system, there is no "jumping-the-gun" regarding this point. The "why" questions are asked before the "what" questions and relate to a wholistic user environment.

The assumption that the user perspective is important has been the focus of the researchers discussed in this paper. For the sake of a contrast in viewpoints, their assumption is one that runs counter to what some proponents of traditional information systems believe--that the user is at fault if he is not able to get the information he needs from the system. Dervin says as much in her

research on communication gaps and inequities. In the traditional communications model (i.e., sources-sending-messages-to-receivers), information availability is supposed to lead to use (research has shown that that is not necessarily true) (Dervin 1980, 83). If information availability does not lead to use, it is because the user may have done something wrong. In a user-oriented information system, assumptions such as those put forth in traditional communication models do not focus on what Taylor has said about information transfer--that it is an intensely human process (Taylor 1986, 1). A user-oriented system, then, serves the purpose of emphasizing the "human" in the process. This call for a focus on the user and away from the technically satisfying Shannon-Weaver communication model may scare those researchers looking for neat answers, i.e., answers that accommodate quantitative measurement. In a user-oriented information system, neat answers are not necessarily usable answers, given the complexity of human behavior and needs.

Based on the user-oriented approach to information discussed in this paper, a conceptual model should not only be able to identify user information needs, but also be able to identify those needs within their contexts. Situations should be examined as potential input data for the design of information systems. For Taylor, who discusses Value-Added Processes within the contexts of operating systems, situations provide additional criteria upon which to base information systems design. Generally, situations have more ill-defined boundaries than questions. Traditional

information systems are good at providing facts for questions. But questions do not take into account the dynamic process of human information seeking and information transfer. The process is dynamic, because information need is a condition in which certain information contributes to the achievement of a genuine or legitimate information purpose (Derr 1983, 276). Condition means context or situation or, as Dervin would call it, a micro-moment in time. These needs are means to other ends, not ends in themselves. Purpose and goals change and situations change. Situations are pivot points in the process of satisfying information needs. The situational, the contextual, is part of a dynamic process. Movement toward the solution of one need may help a user redefine another need. Given the cognitive orientation that this paper takes toward information needs and uses, each user has shifting cognitive maps, as Belkin has said. In addition, each user possesses topological maps, which include goals and objectives at the ends of various journeys that lead to a satisfaction or redefinition of needs (information or other). For example, a user who seeks a higher paying job may seek information about other companies that will compensate him better than his current employer. Should another employer meet his monetary needs, he will stop seeking job-related information, at least for the time being. The boundaries of the area of his particular topological map that relate to monetary needs will contract, based on his current situation. Meanwhile, the satisfaction of financial needs may help him redefine his needs regarding shelter. Related to his goals of buying a home some day,

the "some day" may now have arrived. Thus, the topological boundaries related to this need will expand, i.e., his perceptions of the situation will change. The situational context takes place in a dynamic process, not a static one. As is the case of many traditional information systems, there is a linearity in the information transfer process. Dimensionality is what is needed. Considering the situations and environments as inputs to information systems design addresses the multi-dimensional aspects of information needs and uses. Taylor's approach is to look at patterns that are intrinsic to specific groups, which makes it more workable than approaches by researchers who try to analyze the psychological states of individual users (a difficult process at best). Taylor has noted differences among scientists, engineers, and managers in terms of information requirements. For example, paper is the product of scientists, who produce documents related to work that progresses over long periods of time. Engineers produce products or design operating systems. They have a focused direction of inquiry. They may browse literature and talk to many people in order to formulate ideas. Managers use information for a variety of short- and long-term decisions, seeking options and alternatives, versus answers. They rely heavily on telephone calls and meetings (Taylor 1986 39-40). So, while it is important to know user motivations, it is not likely that information systems designers can make use of the individual topological maps developed by individual users. As the examples above note, even among groups, there are a wide range of information requirements. Every goal of

the user cannot be translatable into an effective information system. There are also various time, money, and design constraints. But, by looking at how groups behave in certain environments, and the kinds of information needs they demand in those environments, information systems designers can go beyond just facts as solutions to system queries.

Research has shown that facts are not enough to satisfy the information needs that arise within the complexities of organizations (Mick, Lindsey, and Callahan 1980, 354). Information is needed by the participants in certain roles in organizations to meet various needs, e.g., planning, controlling, decision-making, satisfying vocational goals, communicating with other participants in the activities of the organization. As a result, there are certain environmental variables that can be studied, especially in the work environment.

There is repetition in many of the activities in a work environment, but it is a dynamic environment (some more than others; situations change even in the more bureaucratic environments), because it must constantly adapt to internal and external forces in order to survive and succeed in a rapidly changing world. As those situations change, there are patterns discernible to researchers. As Hall has stated, the study of patterns is a response to the failures of facts-only information systems, which do not make use of user input. Groups of people in work environments share values and opinions, whether based on personal beliefs or goals of the organization. Those values and

opinions, although not easily quantifiable, must be part of the input to information systems design. The study of individual information-seeking behavior is a worthy goal, but the study of patterns of group information-seeking behavior is a more workable goal, and one that combines individual perceptions with the particular culture or sub-cultures in which people exist. It is a goal that looks at the contexts in which people move to seek information. In examining Dervin's work, although it seems, at times, that she looks at information need only in terms of individual user construct, the reality of much of her research shows that group patterns are important inputs to systems design, e.g., her study about California library users. She looks at the situations in which certain groups of users, e.g., young adults, find themselves in a library. Her focus is on affective, as well as cognitive needs. It is an important element of such research, because not all library users come to the library to become better educated. They may want only light entertainment, such as reading the most current issue of their favorite sports magazine. Dervin's Sense-Making model examines the situations people find themselves when there are gaps in their reality, and the steps that are taken to build "bridges" over those gaps. It is an approach that can be labor-intensive and time-consuming, given the interview methodology used. But it is also an approach that can address the urgency of certain issues in people's lives. For example, she has studied the treatment of cancer patients (Dervin 1983a, 28). Findings in that study supported the situational focus of Sense-Making. In one

finding, questions asked of patients that were not about processes and objects seen as connected to one's (i.e., patient's) own situations were judged as the least likely to have helpful answers (Dervin 1983a, 22). Sense-Making focuses on gaps in people's realities; it also fills a gap in information needs research by addressing the needs of particular groups. It is not the be-all, end-all, however; a traditional information system would be the better choice for someone interested in researching the history of a particular treatment for cancer patients. In that example, a documents-as-answers-to-questions-about-subjects approach would suffice (it does not have the same sense of urgency as noted in the other example about cancer patients. This example of when to use a traditional information system, versus an alternative system, goes back to Taylor's concerns about traditional information systems: they cannot handle the complexity of certain information needs, thus, there is the need to add value.

A third component of a proposed conceptual model for information systems design considerations relates to the interaction between a user and an intermediary (when the system is is one that is mediated by an intermediary). This component draws from some of the strengths of the work of Dervin, Taylor, Wilson, and others who focus on the communication process. It is a move away from Belkin and those who have attempted to extend his research in man-machine interactions, and the use of linguistic analyses as part of the methodology. The emphasis here is on a human intermediary, because the improvement of the communication

process has implications for improving the quality of life in many areas, e.g., social, work, and personal relationships, not just in information seeking. That is why, in the least, the spirit of Dervin's research is appealing. Her expertise is in communications, one of the disciplines involved in the study of information science. Shannon and Weaver and other hard sciences researchers have been widely cited; it is time for researchers in the softer sciences to come to the fore, bringing different perspectives to the many debates about the difficult issues in information science, e.g., relevance. The model proposed here accepts perspectives from the soft and hard sciences, with the hope that researchers interested in the communication process can some day have an impact on human communication (which will lead to information with more meaning) similar to the impact that Shannon and Weaver have had on technical communication.

A strong communications orientation to information needs and uses research examines the user perspective. Through question-negotiation or a similar technique the communication process has the potential to draw out the motivation behind the context in which the information need is expressed. The intermediary tries to open pathways to greater awareness by helping the user examine his information need at levels below how it is phrased to compromise to the system's specifications. The question-negotiation process attempts to explode the linearity of the information system that views relevance as only a document-question match. Individuals are put into a position in which there are the possibilities of

encounters with meanings, rather than just questions asked. The intermediary facilitates this process, allowing the user the freedom to move away from conformity, from the linearity of the document-question match information system. The intermediary encourages the user to explore the elements of his values and beliefs as they relate to a particular need. There is the potential for new insights and new meanings from the user because, at the core of this process, the intermediary has shown a trust in the mind of the user. This trust is an important component of information systems design--as important as the books, documents, technology, classification systems, and other components of an information system. It should not, however, exist without them to try to solve information problems. All elements can be important tools in the hands of competent professionals, whether they be intermediaries or systems designers or other participants in the process. The researchers examined in this paper have that trust in varying degrees. This paper has focused on a human, versus another type of intermediary, in order to emphasis a necessary shift in the design of information systems--a shift toward a focus on the motivations, beliefs, and values that underlie the movement of individuals to seek information in various situations. A human intermediary is better equipped than, for example, an expert system software program, to draw out those motivations.

The ideas about a user-oriented information system, the situationality of information needs, and the interaction between a user and a human intermediary presented in this conceptual model

model relate to the issue of relevance, which is the central concern in information science (Froehlich 1989, 307; Saracevic 1975, 321). Relevance can be defined as the criterion by which the output of a particular information system is judged appropriate to a user's needs and/or problem statement (Froehlich 1988, 19). Put another way, users want the right information: of the right quality, the right extent, in the right manner, in the right circumstances, with the right motive (Froehlich 1989, 307). The elements of the conceptual model discussed in this paper point to the need for a more sensitive view of relevance--one that may be aided by the development of theory that is based more on how man derives self from the always-already-existing social and cultural world from within which the self interprets and creates itself (Froehlich 1988, 20). This view of relevance addresses the dimensions and complexities of the issue, adding qualitative and contextual considerations to relevance judgments that this paper has proposed. Researchers who propose alternative paradigm approaches in information needs and uses research are those who have examined the qualitative and contextual nature of relevance judgments.

A so-called more sensitive view of relevance contrasts with the view of relevance that might be associated with a document-question match (i.e., best match) information retrieval system: relevance is the effectiveness of a contact between a source and a destination (Saracevic 1975, 322). This definition lends itself more to quantitative measurement, i.e., did the information

retrieval system match a document to a user question? This view of relevance is more oriented toward the quantitative, which is not surprising, given that the researcher's conceptual orientation is taken from the Shannon-Weaver Model of Communication Theory. The communication process in that theory is not one within a social domain (the domain suggested by the opposing view of relevance); instead, it is really a statistical theory of signal transmission. It is most concerned with the technical aspects of communication. It should not be confused with the argument that information transfer is a product of society--men working together to achieve certain ends. In other words, information science is an aspect of the communication process and communication is a social phenomenom (Shera 1971, 77). That statement is a perspective from which this paper's conceptual model has been developed; it is one that leads toward a focus on the development of a more sensitive view of relevance.

CHAPTER 4

CONCLUSION

This study has argued for the importance of the user perspective in information systems design, despite the complexities of trying to identify and translate the behavior of human beings into language that is comprehensible to an information system and integratable into system design. Each of the approaches identified in this study seek to examine the contexts, environments, or situations in which information needs arise. Many traditional technology- and content-driven information systems have, at times, effectively matched a knowledge resource to a user question. But a question only represents one level of information need. There are other levels of need that must be examined in order to produce information that will be meaningful for the individual and, thus, for society. This paper has presented a conceptual model that includes various elements necessary for information systems design considerations. The model has not presented a comprehensive examination of the issues related to physical and logical access to information. Instead, it has targeted a few important elements: 1) an information system should be user-oriented; 2) information need should be determined as it relates to users' particular situations or contexts; and 3) in information systems mediated by intermediaries, the user-intermediary interaction is of prime

importance in determining and translating information needs, both for system design and implementation. These issues point toward the need in information science for the development of a more sensitive view of relevance--one that includes contextual and qualitative judgments.

CHAPTER 5

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